Risk and Career Choice: Evidence from Turkey

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Abstract:

Human capital is an important factor in economic development. Yet, we know little about the decision on which *type* of human capital to obtain. In this paper, we examine the college major choice decision in a risk and return framework using university entrance exam data from Turkey. Ours is the first econometric study on risk and career choice behavior in a developing country. We use a unique dataset that allows us to control for the choice set of students fully. Our results show that parental income and self-employment status are important factors influencing an individual in choosing a riskier career such as business over a less risky one such as education or health.

JEL codes: I2, O12, HO

Keywords: career choice, career risk, multinomial logit model, education, Turkey.

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1. Introduction

Human capital is an important factor in economic development. Yet, we know little about the decision on which type of human capital to obtain. Becker (1964) observes that since human capital is both risky and illiquid it should demand a premium over safer assets. In this paper, we examine the college major choice decision in a risk and return framework using university entrance exam data from Turkey.

Investment in college education allows a person to earn a stream of labor income depending on the properties of the career he has chosen. In this way, investment in education is similar to a financial investment and is likely to be affected by return and risk concerns of the investor. In Turkey, there is macro level unemployment risk due to periodic economic crises as well as wage income risk due to individual differences in ability. Certain majors such as education and health are considered to have low macro level unemployment risk since graduates of these majors are largely employed by the public sector and public sector employees are rarely fired. Saks and Shore (2005) argue that there may be major specific idiosyncratic risk if agents do not know their ability before entering a career and differences in ability cause dispersion in wages. Either way, agents would require a risk premium to enter into careers that they perceive as more risky. However, richer individuals should demand smaller risk premiums and consequently be more willing to choose riskier careers.

Our paper contributes to the literature on major choice in four ways. First, we allow for parental influences on attitudes towards risk when measuring the effect of parental income on major choice. Second, we analyze the major choice problem and not the major placement problem that has been analyzed by earlier studies utilizing data on students who have already chosen and been placed into majors. Major placement is a combination of student's choice and university/major specific criteria for acceptance. Since students list and rank their preferences across majors and universities after they take the centralized university entrance exam (OSS), we observe in our data their most preferred choice as well as their placement.

Third, we are able to control for the major choice set available to the student. Students are placed according to the scores they get on the centralized university entrance exam. In other words, the exam score is the only determinant of university/major placement. Hence, we are able to control for the university/major choice set by controlling for the exam score. Researchers who work with U.S. data control for SAT scores, which are informative of students' choice sets but do not completely determine the available choices, since other

factors such as extracurricular activities, essays and even demographic characteristics such as race and income also play a role. Hence, there is the potential problem of not being able to control for the choices available to an individual. We solve this problem by taking advantage of the special features of the student placement system in Turkey.

Finally, to our knowledge, ours is the first econometric study on a developing country that examines the college major choice in a risk and return framework. The impact of income and risk on career choice has important policy implications. Poor students may be systematically more likely to avoid risky human capital investments, even if these investments entail high expected personal returns. To the extent that high personal returns also imply high social returns, it may be efficient for governments to provide larger subsidies for these investments to poor students.

Our main finding is that parental income and parents' self-employment status are important determinants of choosing a riskier major such as business over a less risky one such as education, controlling for the OSS score and other socio-economic characteristics. Controlling for university preferences in a university level fixed effects specification, we find that a 100 percent increase in parental income increases the relative probability of majoring in business over education by 49 percent. A change in father's status to self-employment increases the odds of majoring in business over education by 62 percent.

The plan for our paper is as follows: In the next section we summarize the related literature. In section 3, we describe the university entrance exam system in Turkey. Section 4 builds the theoretical framework of the paper. In section 5, we explain how we measure career risk in Turkey. After describing the data in section 6 and the econometric model in section 7, we discuss the results of our study in section 8. Section 9 concludes our paper.

2. Related Literature

There is a large literature on estimating the monetary returns to college education. The standard approach to measure these returns is a Mincerian type equation which regresses income on educational attainment as well as other demographic characteristics. Prominent examples are Ashenfelter and Krueger (1994) and Angrist and Krueger (1991). A recent example from a developing country is by Behrman et al. (2008) where the authors assess the effects of both the quantity and quality of schooling on earnings. A related body of literature examines the problem of choosing the optimum quantity of educational investment. Becker (1964) observes that since human capital is both risky and illiquid it should demand a

premium over safer assets. Levhari and Weiss (1974), Williams (1979) and Judd (2000) model the decision about what quantity of education to receive when investment in education is risky.

There are relatively few papers that examine the link between type of major and returns to major choice. Boskin (1974) finds that an occupation with higher lifetime earnings and lower training costs is more likely to be chosen. Berger (1988) finds predicted future earnings influence the choice of college major of young men. Neither of these papers analyzes the differential impact of initial income on different careers.

Saks and Shore (2005) examine how the financial risk associated with different careers influences career choice using the National Postsecondary Student Aid Survey from US. In their model, individuals demand a premium to enter careers with more idiosyncratic risk. However, if agents have DARA (decreasing absolute risk aversion) preferences, the required size of that premium falls with family wealth. They argue that controlling for ability and preferences, wealthier individuals should demand smaller risk premiums and consequently be more willing to choose riskier careers. They analyze students who have already chosen and been placed into majors and use SAT scores to control for students' choice set. They do not control for parents' self employment status. In this paper we build on their framework by analyzing major choice rather than placement, controlling completely for the major choice set available to the student and also allowing for parental influences on attitudes towards risk. We control for father's self-employment status as well as parental income when we examine the major choice problem.

In the occupational choice decision, parental characteristics may have an important role along with risk and return characteristics of occupations. The influence of family background on children's education and occupation choices and their economic outcomes has been the focus of research by sociologists and economists. One branch of this literature examines the intergenerational mobility consequences of parental influences on occupational choice. Using mobility matrices that show the transition probabilities from fathers' occupations to sons' occupations, Kerckhoff et al. (1985) find close association between the occupations of the two generations. Using similar techniques, Long and Ferrie (2005) find that the U.S. had higher occupational mobility across generations than Britain in the end of the 18^{th} and the beginning of the 19^{th} centuries.

Another branch of the related literature uses more detailed micro-level data to assess intergenerational transmission of occupational status. Dohmen et al. (2006) document robust intergenerational correlation in risk attitudes, based on answers to survey questions. They

argue that transmission of risk attitudes could work through various channels; genetics, child learning by imitation, or deliberate efforts by parents to shape the preferences and beliefs of their children. Nguyen and Haile (2003) use an ordered logit model to find strong evidence of intergenerational transmission of occupational status for both male and female children. They find that the link between father and child was stronger than the link between mother and child. Similarly, Carmichael (2000) finds that the occupational attainment of sons depends significantly on the socioeconomic status of their fathers. Thinking of the mechanisms that explain the high correlation of occupational status of parents and children, one could hypothesize that the intergenerational transmission of attitudes, personality, or other personal traits generate the persistence of socioeconomic status across generations. Regardless of which channels are at work, we would expect parental occupation to have an effect on the occupational choice of the children if occupations have different risks and risk attitudes are transferred across generations.

Also related to our study is the literature on the effect of parental characteristics on entrepreneurship. It is well-known that the children of the self-employed display a greater propensity to become entrepreneurs. Otherwise, family firms would have become extinct. Yet, most companies are established as family businesses and many of them continue to operate as family businesses. In the United Kingdom, it is estimated that family firms account for 65% of the 4.6 million private sector enterprises (Institute for Family Business, 2008). According to a study conducted in Turkey by the Gaziantep Chamber of Industry, based on a survey of 200 large manufacturing firms in Gaziantep, 85% of these firms are family businesses (Bia Haber Merkezi, 2000). One explanation of this phenomenon is that starting up a business requires capital. Successful entrepreneurs help ease the financial constraints of their children by transferring funds to them. Another explanation is that parents transmit to the children their work experience, reputation and other managerial human capital. Evans and Leighton (1989) find that assets have an important role in men's transition to self-employment. Dunn and Holtz-Eakin (2000) find that parental wealth has a large influence on the child's transition to self-employment, but the parents' strongest influence comes from their own self-employment experience and business success. These findings suggest that the occupational status of the parents may have an influence on the children's career choice and thus should be included in the analysis.

3. The Setting: The University Entrance Exam in Turkey

Students who wish to receive university education are required to take a nationwide test called the OSS (can be translated as "Student Selection Exam"). The OSS exam is a highly competitive national event. It is given once a year and more than one million students participate each year. More than half of the students who take the test are repeat takers who are either current university students unsatisfied with their programs or high school graduates trying to get a score high enough to be admitted to a program at a university.

The exam is composed of different sections. Students decide which sections to answer based on their major choices. In 2002, the year that our data was collected, the OSS exam had two main sections (verbal and quantitative) and a foreign language section. The verbal section was composed of questions on Turkish language and on social sciences (history, geography, philosophy). The quantitative section had questions on mathematics and on natural sciences (physics, chemistry and biology).

For each student four different OSS scores were calculated by assigning different weights to the sections of the exam. These were the OSS-Verbal score (OSS-SOZ), OSS-Quantitative score (OSS-SAY), OSS-Equal-weighted score (OSS-EA) and the OSS-Foreign Language score (OSS-DIL). The raw score on the quantitative section had a higher weight in the OSS-SAY score, whereas the verbal section had a higher weight in the OSS-SOZ score. The verbal and quantitative sections had equal weights in the OSS-EA score. The foreign language raw score had zero weight in all types of OSS scores but the OSS-DIL score.

The raw scores in the tests were further weighted by indices for high school performance. In Turkey, high school students choose fields of study. In the 2002 data provided by the Student Selection and Placement Center (OSYM), there were four fields; Science, Turkish-Math, Social Sciences and Foreign Languages[1]. As part of a policy to encourage students to choose programs that are compatible with their high school fields, high school performance measures of the students were multiplied by a bigger factor if the chosen programs were compatible with the high school field.

Adding the average high school grades, multiplied by a factor, to the OSS scores, four new scores called Y-OSS-SOZ, Y-OSS-SAY, Y-OSS-EA and Y-OSS-DIL were calculated[2]. Placement to programs was made based on one of these four scores. Some programs admitted students according to their Y-OSS-SAY scores, while others according to Y-OSS-EA scores,

[1] To be precise, there were two other fields, namely arts and theology, but we do not have any data on the students in these fields.

[2] There were some other factors that were included in the final score, but not crucial to our study. We leave them out for brevity.

and so on. Detailed tables that list compatible programs to each high school field were made available to students.

Since it is of special interest to our study, we report in Table 1a and Table 1b lists of programs that are compatible with students who graduate from high school with the Turkish-Math and the Science fields respectively. We categorize these programs according to their risk and return characteristics, based on the groupings that we observe in the related literature as well as on the characteristics of the Turkish labor market.

Table 1a: Programs compatible with the Turkish/mathematics field:

Name of the Category	Programs Included in the Category
1. Education	Kindergarten education, mathematics education, philosophy education, education of the visually impaired, health education
2. Business	Banking and finance, tourism management, insurance, international finance, international trade, logistics, accounting
3. Econ-Pol-IR	Economics, political science, public finance, international relations, public administration, European Union relations
4. Social Sciences	Anthropology, philosophy, sociology, psychology
5. Law	Law
6. Literature	Turkish language and literature

Source: OSYM (2002)

Table 1b: Programs compatible with the Science field:

Name of the Category	**Programs Included in the Category**
1. Education	Kindergarten education, mathematics education, philosophy education, education of the visually impaired, computer education
2. Business	Business
3. Econ-Pol-IR	Economics, econometrics
4. Engineering	All engineering programs
5. Science	Physics, chemistry, biology, genetics, astronomy
6. Health	Medicine, dentistry, nursing, veterinary, midwifery

Source: OSYM (2002)

After the scores of the OSS exam were announced, the students who scored above a certain threshold were asked to submit their choice lists. Each candidate could include up to 24 choices in the list. The choices represented the programs that the candidate wished to be enrolled in, ranked from the most preferred to the least preferred. After collecting the choices from all candidates, a computer code was used by the OSYM to admit students to programs, taking the quotas of the programs into account. In each category (SOZ, SAY, EA, DIL), the candidate with the highest Y-OSS score was admitted to the first program in his choice list. As the quotas of the most popular programs were filled, candidates with lower Y-OSS scores were assigned to their less preferred programs, or to no programs at all if the quotas of all the programs in their choice lists had already been filled.

4. Theoretical Framework

We assume that agents are risk averse when they make their major choices. Labor income Y_c depends on an agent's career choice and can be decomposed into a risky component η_c and a deterministic components θ_c for career c:

$$Y_c = \theta_c + \eta_c \,, \quad E(\eta_c)=0.$$

We consider career c to be safer than career c' if Y_c second order stochastically dominates $Y_{c'}$.[3] This means that if $\theta_c = \theta_{c'}$, the risky component $\eta_{c'}$ for the riskier career c' has a higher variance than η_c. Note that $\eta_c = -\theta_c$ corresponds to job loss. All risk averse expected utility maximizers prefer a second order stochastically dominant career to a dominated one. If in addition to risk aversion we assume that agents have decreasing absolute risk aversion (DARA), agents become less concerned about specific risks as they get richer[4]. DARA preferences are such that the coefficient of absolute risk aversion $r(Y) = -\frac{U''(Y)}{U'(Y)}$ is decreasing. An example of such a utility function is $U = \ln(Y)$. We should also note that both experimental and empirical evidence seem to support DARA preferences.

[3] If career c yields unambiguously higher income than career c' then we say that Y_c first order stochastically dominates $Y_{c'}$. If career c second order stochastically dominates career c' then $\int_0^y F(Y_c)dY_c \leq \int_0^y F(Y_{c'})dY_{c'}$ for all income levels y, where F(.) indicates the cumulative distribution function. By definition, first order stochastic dominance implies second order stochastic dominance, but not vice versa.

[4] Saks and Shore (2005) provide a proof of this statement.

In this framework, richer agents will be more comfortable undertaking risky careers than poorer agents. Agents demand a wage premium to enter a risky career over a safe one, simply because they are risk averse. However if agents have DARA utility, the demanded wage premium falls as they get richer.

5. Estimating Career Risk

In Turkey, there is macro level unemployment risk due to periodic economic crises as well as wage income risk due to individual differences in ability. There are no data on unemployment rates of different majors in the Turkish labor market. However, it is common knowledge that certain majors such as education and health are perceived to be safer than others in terms macro level unemployment risk. This is mostly due to the dominance of public sector employment in these areas.

A recent master's thesis (Ovet, 2006) studies the factors that explain why a group of Turkish students have chosen to major in education. The study is based on a survey of students enrolled in the Faculty of Education at Eskisehir Osmangazi University, studying towards degrees in classroom, math, science and computer teaching. The questions in the survey aim to identify the extent to which various factors have an influence on the students' choice of education as a career. Using the factor analysis technique, four factors are identified. Two factors with the highest explanatory power are the non-pecuniary returns factor (being fond of children, having the talent and desire for teaching, having an appeal for community service etc.) and the search for safety factor (job and retirement security).

Based on a survey of medical school students, Alper and Ozdemir (2004) report that the "employment guarantee factor" is the second most important reason for choosing medical school after the "willingness to help others" factor which is ranked the first. The study by Vehid et.al. (2001), again based on a survey of medical school students, finds that having a doctor in the family had a positive influence on the students' choice, confirming the previous findings that parents' occupation status has a role in determining the child's occupation.

The public sector is the largest employer of teachers and health personnel in Turkey. Currently there are 622,864 teachers employed in the public education system, and only 34,321 teachers employed by private teaching institutions (February 2008, **http://personel.meb.gov.tr**). According to the latest statistics released by the Ministry of Health, there are a total of 103,177 medical doctors, 17,750 dentists, 24,515 pharmacists,

92,509 nurses and 46,172 midwives in Turkey. While private sector employment is more prevalent among dentists and pharmacists, public sector is clearly the main employer of the other health personnel. 81% of doctors, 85% of nurses and 93% of midwives are employed by the public sector (Saglik Bakanligi, 2008).

Graduates with education or health degrees have a higher chance of being employed in the public sector, compared to graduates of other majors. About 48% of the 1,632,482 civil servants employed by the central government (the bulk of public sector employees) are employed in the education (35%) and the health sector (13%) (Guler, 2003). Out of the 189,491 students who graduated from Turkish universities in the 2002-2003 academic year, 19.65% had an education degree and only 7.43% had a health related degree (authors' calculations based on the statistics provided by YOK (the Turkish Council of Higher Education)). These numbers allow us to draw a distinction: While only 27.08% of graduates have education or health degrees, teachers and health personnel constitute 48% of civil servants. These two fields are clearly overrepresented in public sector employment, emphasizing the career safety feature involved in these fields.

To be hired by the public school system, a teacher needs to get a minimum score in a centralized exam (KPSS) in addition to majoring in education. In 2007, an additional 40,000 teachers were hired by the Ministry of Education. According to the Student Selection and Placement Center of Turkey, in the 2006-2007 academic year, 48,884 teachers graduated from Education Faculties of universities (OSYM, 2008, Table 13). Evidently, the number of new hires by the public sector is very high relative to the number of graduates. Yet, we have to mention that the hiring process is competitive, since those with the highest KPSS score are given the priority and the number of new hires includes graduates of previous years as well as fresh graduates. In some teaching fields, finding a job can be quite a challenge.

While the wages of public school teachers vary according to rank, seniority, type of school, the variance is not large. The monthly (net) wages are between 800-1600 U.S. dollars for teachers of all ranks and types. For a starting teacher, it is not even realistic to talk about a wage variance in the public school sector[5]. It is well known that some public school teachers complement their salaries by private tutoring, and that teachers in Turkey are not considered to have high expected lifetime earnings. What they have is job security, especially if they are employed by the public school system. According to the Ministry of Education the fact that

[5] Actually this is true for all public sector employees as they are offered the same wages at the entry level (i.e. no variation due to ability) and modest rates of wage raise by rank.

40,000 additional teachers are hired each year by the public sector makes education an attractive career choice.

The Ministry of Health provides data on the average net wages of health personnel in the public sector by profession (Saglik Bakanligi (The Ministry of Health) (2005). The highest wages are earned by medical specialists, followed by practitioners, and the lowest by nurses and midwives. According to these data, average monthly net wages of health personnel are 700 for nurses and midwives, 900 for pharmacists, 1100 for practitioners, and 1350 for specialists, all expressed in U.S. dollars. There is not much variation by rank or by geographical region. An important source of earnings variation, though, is payments made by revolving funds at some hospitals. These irregular payments are in addition to the regular wages and they vary according to profession, rank and performance. Expected payments in U.S. dollars are 400 to 550 for nurses, 1,000 to 2,500 for practitioners, and 2,500 to 4,000 for specialists.

Although the earnings variation in health careers is apparently not as small as in the education sector, the fact that there is a high likelihood of being employed in the public sector makes health an attractive career choice. Furthermore, as there is a small chance of being unemployed in the health sector, the main earnings variation is caused by extra payments such as the revolving funds payments, which move earnings only upwards.

Hence we argue that, if education and health degrees are more likely to shelter an individual from unemployment risk then we would expect agents with higher risk aversion to choose these majors.

Another attractiveness of the education programs is the scholarship offered by the Ministry of Education. To increase the supply of teachers, the Ministry of Education has been supporting a number of students (the quota may change yearly but it was between 1000 and 2000 in years 2000-2004) who specify an education program within their top five choices and who are admitted to one of these programs, by providing them with a scholarship during their studies with a condition to work in the public sector after graduation. This incentive must have influenced the major choices of many students. According to the Ministry of Education, 48% of the 1,419,127 students who took the OSS exam in 2001 placed education programs in their choice list. Among those who were admitted to education programs, 57% placed these programs within their top five choices.

Having established that job security of education and health majors due to the dominance of public sector employment is an important characteristic of these careers, we next look at the wage differences across other majors to determine which of these majors have

higher income risk. Unfortunately, there are no major specific wage data available for Turkey. Hence we conducted a survey among the graduates of Bilkent University[6]. Within an occupation, cross sectional differences in wages is one measure of labor income risk, however it is an imperfect measure since the cross sectional dispersion in wages cannot differentiate unobserved heterogeneity from risk. If people know their ability before entering a career, then the cross-sectional dispersion of wages will overestimate the degree of risk.

More than 1500 graduates responded to our survey. In the survey, we asked questions on the sex, age, department of graduation, work status (employer, wage-salary worker, self-employed, retired, not working), years of experience in current job, years of experience in previous jobs and father's education level (primary, junior high, high school graduate, vocational school graduate, university graduate, master's degree, Ph.D. degree). We also asked questions on the monthly net compensation (i.e. net income plus any subsidies) of salaried and wage earning workers. In these questions we requested the respondents to choose from a set of income brackets.

We use the survey data that we collected to examine the compensation differences among salaried or wage workers who graduated from departments that coincide with the categories in our analysis. As shown in the Table 2a, there are 682 observations obeying these restrictions. Most of the respondents are younger than 30. The breakdown of graduates according to their majors is shown in the table. The advantages of our survey data are that the respondents are mostly young, meaning that they are less likely to know their abilities, and that we can control for observable measures of ability.

Table 2a: Descriptive statistics of the survey data on Bilkent University graduates.

[6] Bilkent University is a prestigious private university in Turkey. It enrolls about 12,000 students. However, it does not offer any education or health programs, therefore we cannot obtain any information on the riskiness of these fields based on these data.

		Frequency	Percent of the sample
Sex	***Male***	375	55.0
	Female	307	45.0
Age group	***20-25***	393	57.6
	26-30	183	26.8
	31-35	79	11.6
	36-40	25	3.7
	41-45	2	0.3
Business	***Management***	152	24.2
	Accounting Information Systems	13	
Econ-Pol-IR	***Economics***	135	42.7
	Political Science	64	
	International Relations	92	
Engineering	***Electrical and Electronics Engineering***	50	33.1
	Industrial Engineering	95	
	Computer Engineering	81	
	Number of observations	682	

Source: Authors' calculations based on the survey of Bilkent University graduates.

Using these data, we compute the unconditional and conditional means and standard deviations of monthly compensation by college major along with the minimum and maximum values. We report these numbers in Table 2b. The "unconditional" statistics are what we directly observe in the cross section. To remove at least some part of the dispersion in cross sectional wages that is due to unobserved heterogeneity rather than risk, we control for individual and parental characteristics via an OLS regression. The descriptive statistics of the residuals from this regression are what we report as "conditional" in the table.

Table 2b: Descriptive statistics of monthly compensation by college major (in U.S. dollars)

	Unconditional				Conditional				
	Min	Max	Mean	Standard deviation	Min	Max	Mean	Standard deviation	N
Business	623	8480	2670	1889	-3390	5068	69	1389	165
Econ-Pol-IR	623	8480	2071	1298	-3915	6848	-285	1236	291
Engineering	1023	8480	3169	1962	-4302	5931	316	1427	226

Source: Authors' calculations based on the survey of Bilkent University graduates.
Note: In the "conditional" part of the table we report the descriptive statistics of residuals from an OLS regression of monthly compensation on sex (1: male, 0: female), years of experience in previous jobs, years of experience in the current job, age, age squared, seven dummy variables for father's

education (the omitted dummy is no education). We report the full regression results in the Appendix Table 1.

Based on the statistics reported in Table 2b, we can compare business majors to Econ-Pol-IR majors. Given that the incomes of business majors are higher in both mean and variance, and mean income is low relative to standard deviation, we conjecture that business careers can be regarded as riskier careers. More important to our study, business, Econ-Pol-IR and engineering careers entail higher risk compared to education and health. Although we do not have the data to perform a similar analysis, we can make a judgment based on what we know about careers in health and education. The net monthly wages of teachers are between 800-1600 U.S. dollars as reported earlier, while the income range for business majors is much wider. Furthermore, the expected average income is higher for business majors. In other words, a business career has higher income risk and a higher expected return than an education career. Therefore, we would expect a risk averse high school graduate with a Turkish-Math field to prefer education to business or Econ-Pol-IR.

It is possible to make a similar comparison of health to engineering based on the statistics in Table 2b. The expected income for an engineer is higher and the income range for engineers is much wider compared to health personnel[7]. As reported earlier, average monthly net earnings of health personnel are 1200 for nurses and midwives and 2500 for practitioners, both expressed in U.S. dollars. We know that there is not much variation by rank or by region. Therefore, we would expect a risk averse student with a Science field to prefer health to engineering.

6. The Data

In the 2002 data provided by the OSYM of Turkey, there are four high school fields for the university exam applicants; Science, Turkish-Math, Social Sciences and Foreign Languages. The dataset that we use contains one random sample from each of these fields. Each sample contains data on about 40,000 students. As we mentioned before, we have identified the business and engineering majors as carrying a higher risk than the education and health majors, respectively. Since students who choose business programs are mostly from the TM field, the TM dataset is very suitable for estimating the odds ratio of choosing the

[7] We prefer to exclude medical specialists from the earnings comparison as being a specialist requires extra training after a university degree. In Turkey, medical school is an undergraduate school whose graduates can either work as practitioners or study an extra 3-5 years and become specialists.

business major over the education major. The Science dataset contains students who are mostly interested in engineering and health; it is therefore suitable for examining the choice between health and other fields including engineering and natural sciences.

For each student, we have data on various OSS scores, high school code, high school performance measure, the student's choice list, and if the student was admitted to a program, that program's code and preference order of the program in the choice list of the student. Our dataset also includes information on some family and individual characteristics such as the gender of the student, the number of siblings, education of the parents, employment and social security status of the parents, family income, whether and for how long the student received private tutoring to prepare for the exam, the number of times that the student has taken the exam and population of the area that student attended high school. The data on the socio-economic background of the students were collected by a survey conducted on the students registering to take the OSS exam.

We merged the survey data with the list of programs in universities to which placement is made via the OSS system. With this merge, we are able to identify all majors (programs) that a particular student chooses. Since we are interested in occupational choice, we restricted the data to the students who specified at least one program in their choice lists. As we mentioned in section 3, only those who scored above a certain threshold were asked to submit their choice lists. Hence our sample size drops to about 11,000 with this restriction. Further, we exclude students who listed open university or evening programs as their first choice since these students might already have jobs and careers. This restricts the TM data to about 6,500 observations and the Science data to about 9,000 observations.

In 2002, there were 76 universities (including both private and public) in Turkey, with more than a total of 3000 departments offering about a hundred different 4-year degree programs. Since it is not feasible to analyze the choice decision among such a large number of programs, we need to group them into main categories. These categories are shown in Tables 1a and 1b of the setting section.

In our data, we observe very high demand for the education and health majors. Among the students who qualified to submit a choice list, 49% in the TM data indicated education as their top choice. In the Science data, among those who qualified to submit a choice list, 22% indicated education and 27% indicated health as their top choice[8].

[8] After excluding those who indicated open education or secondary education programs as their top choice.

The numbers presented in Table 3 are evidence that there is excess demand for education and health programs according to our data. In the TM data, among students who indicated education as their top choice, only 55% were admitted. In the cases of "Business" and "Econ-Pol-IR" majors, we see that the same ratios exceed 100%, meaning that these programs were not the top choice of those who were admitted to them. In the Science data, 85% of those who indicated "Education" as their top choice were admitted. The same ratio is 63% for "Health". For all other fields in the Science data, this ratio exceeds 100%. For the "Econ-Pol-IR" category, the ratio is the highest at 244%, meaning that less than half of those who were admitted to these programs listed them as their top choice.

Table 3: The chances of being admitted to the top choice by major category.

	(1)	(2)	
TM Data	Number of students indicating as top choice	Number of students admitted	(2)/(1)
1. Education	2582	1422	55%
2. Business	583	936	161%
3. Econ-Pol-IR	853	1742	204%
4. Social Sciences	330	332	101%
5. Law	729	488	67%
6. Literature	192	239	124%

	(1)	(2)	
Science Data	Number of students indicating as top choice	Number of students admitted	(2)/(1)
1. Education	1803	1536	85%
2. Business	316	497	157%
3. Econ-Pol-IR	146	356	244%
4. Engineering	2737	2973	109%
5. Sciences	1037	1525	147%
6. Health	2284	1436	63%

Source: Authors' calculations based on 2002 OSS data.

The descriptive statistics of our sample are reported in Tables 4a and 4b. In these tables as well as in all regressions, we exclude students who listed open university or evening programs as their first choice. A glance at the descriptive statistics shows us that family income is the highest for students who chose business major and the lowest for those who

chose education major. Father's self-employment rate is the highest for those who chose business. Father's education is also higher for those who chose business than those who preferred education major. A higher percentage of those who chose business are male, relative to education. Those who chose education come from larger families, as indicated by the number of siblings. Furthermore, population and tutoring hours are the lowest for those who chose education. In sum, the students who chose education come from smaller residential areas; they have larger families and lower family income, when compared to the students who chose a riskier major such as business.

7. Econometric Model

According to our theoretical framework, a richer agent is better able to tolerate a given amount of risk. Therefore, giving an agent additional income should make him more likely to enter a risky career. We take a student's top choice of an undergraduate major as an indication of his career choice. Our theoretical framework also allows attitudes towards risk to be transmitted from parents to their children. Hence, we control for father's self employment status as well as parental income in our regressions.

We use a multinomial logit model to examine the impact of income and other variables on college major choice. In this framework, the utility that student i receives from choosing major c when faced with C choices, is a random function of his characteristics:

$$U_{ic} = \beta_c' x_i + \varepsilon_{ic}.$$

If a student chooses major c, we assume that U_{ic} is the maximum among C utilities. Hence the statistical model is driven by the probability that choice c is made, which means $Prob(U_{ic} > U_{ik})$ for all $k \neq c$.

Let Y be a random variable indicating the choice made. If the C disturbances are independent and identically distributed with Weibull distribution $F(\varepsilon_{ic}) = \exp(e^{-\varepsilon_{ic}})$, then normalizing $\beta_0 = 0$,

$$Pr_{ic} = Prob(Y_i = c) = \frac{e^{\beta_c' x_i}}{1+\sum_{k=1}^{C} e^{\beta_k' x_i}}, \quad \text{for c = 1,2,…,C.}$$

$$Pr_{i0} = Prob(Y_i = 0) = \frac{1}{1+\sum_{k=1}^{C} e^{\beta_k' x_i}}.$$

The model implies that we can compute C (5 in our study) odds ratios.

$$\frac{Pr_{ic}}{Pr_{i0}} = e^{\beta_c' x_i}$$

The coefficients reported in Tables 5a and 5b in the results section are $e^{\beta_c'}$ and indicate how the odds ratios change in response to an increase in x.

8. Results

We report the estimates of the multinomial logit model based on the TM data and the Science data separately in Tables 5a and 5b. The base categories are education in the TM data and health in the Science data. We are mainly interested in estimating the impacts of a change in parental income and a change in father's self-employment status on the odds ratio of choosing a given occupation relative to the base category, controlling for the OSS score and a rich set of socio-demographic variables. We present two sets of results; one without university dummies, and one with dummies for over seventy universities. The coefficients on the natural logarithm of income, which are calculated as exp($\hat{\beta}$), represent the impact of a percentage increase in income on the odds ratio (the probability of choosing each major relative to the base category), so that a coefficient of one means that increasing income has no impact on the odds ratio. In Table 5a, without university dummies the coefficient on income for a student who chose business major is about 1.97. This means that a 100% increase in parental income will increase the odds ratio by 97%. In other words, doubling parental income almost doubles the probability of majoring in business relative to the probability of majoring in education. Similarly, a student whose father is self-employed is about 98% more likely to choose business major as opposed to the education major. Income and father's self employment status increases the odds ratio for Econ-Pol-IR, law and social science majors as well, although the increase is less than the increase for business majors. For the literature degree, increasing income does not increase the probability of studying literature over education and the effect of father's self employment is small on this relative probability.

[Insert Table 5a about here.]

It is interesting to note that, the OSS score which is the only determinant of a student's placement in a university program, is statistically significant in all regressions. However, economically, the magnitude of its effect is small. For example, a 10% increase in the OSS

score makes a student more likely to choose business over education by only 2.7%. This means that given the chance, a student does not unambiguously prefer business to education. We take this as further evidence that business does not first order stochastically dominate education.

In the second set of results, we control for university dummies for over seventy universities. While controlling for university dummies decreases the coefficients, yet our variables of interest remain both statistically and economically significant. For example, the coefficient on parental income drops from 1.97 to 1.49 for the business major. This means that a 100% increase in parental income will increase the odds ratio by 49%. Similarly, a change in father's status to self-employment increases the odds of majoring in business rather than education by 62%. For the OSS score, we again find results similar to the previous case. Increasing the OSS score by 10% increases the relative probability of choosing business over education by only 0.3 percent. The effect is statistically significant, yet economically very small. Interestingly, the effect of private tutoring hours of business majors is not statistically different from those that choose education. The results on the OSS score and tutoring hours support our suggestion that, business does not first order stochastically dominate education.

The estimates for the other control variables are consistent with our observations of descriptive statistics. Being male, having a more educated father, having fewer siblings, or coming from a more populated area increases the relative probability of choosing business over education. In summary, controlling for the students' choice set by using the OSS score, as well as a number of socio-economic characteristics, we are able to pin down the importance of parental income and fathers' self-employment status on choosing careers that are perceived to have riskier income streams.

We next turn our attention to the university applicants that are from science field of their high schools. The estimates for these students are presented in Table 5b. Here our categories are Education, Business, Econ-Pol-IR, Engineering, Science and Health (the base category). Our control variables are the same as in Table 5a with the exception of private tutoring hours and OSS score. In these regressions private tutoring hours for math and science and OSS quantitative scores are used since engineering and most health degrees require OSS quantitative score and this is based on math and science test scores of students. We again present results with and without university dummies. Since controlling for university dummies gives us more conservative estimates we will discuss only these results.

[Insert Table 5b about here.]

Our results show that increasing income by 100% increases the probability of choosing engineering over health by 29%. Similarly, if father's occupation status switches to self-employment, the probability of choosing engineering over health major increases by nearly 31%. Interestingly, increasing the OSS score by 10% decreases the relative probability of choosing engineering over health by 0.5 percent. Hence, while the OSS score is still not very important, the finding that a higher OSS score suggests that health is more likely to be chosen over engineering strongly suggests that engineering does not first order stochastically dominate health major. The estimates for the other control variables are similar to those for the TM data. In particular, being male, having a more educated father, having fewer siblings, or coming from a more populated area increases the relative probability of choosing engineering over health.

In order to further investigate the risk and major choice relationship we next examine how major persistence varies across majors. Here, the idea is that if certain majors are chosen because they are less risky we would expect students to list those majors in their preference list persistently. Hence, we construct an index which is equal to 1 if the same major is listed in all of the student's top three choices, 0.5 if the same major is listed in the top two choices and zero otherwise. We then run an ordinary least squares (OLS) regression, where the index is the dependent variable and the regressors included are the dummies for the most preferred major as well as the control variables used in our previous multinomial logit regressions. The first column of Table 6 presents results with Turkish-Math field data and the second column presents results with Science field data. According to the first regression, controlling for all socio-economic characteristics, students who list a major other than education as their top choice are less likely to list the same choice as their second and third choices than those who list education as their top choice. In other words, students who choose education major as their most preferred outcome are more persistent in their choices. A similar result is found in the second regression for those who rank health as their top choice. Students who choose health as their most preferred outcome are more likely to list this major in their subsequent choices than those who choose other majors such as engineering, business and science. The only exception is education. Students who choose education as their most preferred outcome are more persistent in their choice than those who list health as their most preferred outcome.

Further robustness checks

Measurement error in income:

Since data on parental income are based on a survey of students, and students may apply for financial aid if they are accepted to a program, there is some concern that those who intend to apply for aid may underreport their income. Hence we have re-done our estimations by excluding students that choose the lowest category of income on the survey questionnaire. Both the statistical and economic significance of our results remain fairly comparable. If anything, the economic significance of parental income is higher when the lowest income students are omitted from the regression. Results are not shown but available upon request.

Model specification

We have also estimated our regressions using the multinomial probit model. Marginal effects from the multinomial logit model and the multinomial probit model are estimated and found to be very similar. These results though not shown are available upon request.

9. Conclusion

Whether and to what extent income and career risk affects career choice is an important question. In this paper, we find strong evidence that in Turkey parental income and self-employment status are important determinants of choosing a riskier major such as business over a less risky one such as education or health, controlling for feasibility (the university entrance exam score) and a rich set of socio-economic characteristics.

Given that family income is an important determinant of career choice, poor students may be systematically excluded from the opportunity of accumulating risky human capital investments that entail high expected personal returns. To the extent that high personal returns also imply high social returns, it may be efficient for governments to provide larger subsidies for these investments to poor students. Furthermore, if poor students are less likely to undertake educational investments with both high risk and high expected return, initial differences in family income may cause long-run economic inequality that persists for generations. This insight adds another motivation for the involvement of governments in providing incentives for the risky education investments of poor students in developing countries.

References:

Alper, Zuleyha; Ozdemir, Hakan, 2004. “Uludag Universitesi Tip Fakultesini Tercih Eden Ogrencilerin Kimi Sosyo-Demografik Ozellikleri ve Meslege Bakis Acilari (The Socio-Demographic Characteristics and the Career Views of Students at the Uludag School of Medicine)”. *Uludag Universitesi Tip Fakultesi Dergisi* 30 (2), 93-96.

Angrist, Joshua D., Krueger, Alan B., 1991. “Does Compulsory School Attendance Affect Schooling and Earnings?”. *Quaterly Journal of Economics* 84 (5), 1157-73.

Ashenfelter, Orley, Krueger, Alan B., 1994. “Estimates of the Economic Return to Schooling from a New Sample of Twins”. *American Economic Review* 84 (5), 1157-1173 (December).

Becker, Gary S., 1964. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* Columbia University Press, New York.

Behrman, Jere R., Ross, David, Sabot, Richard, 2008. “Improving Quality versus Increasing the Quantity of Schooling: Estimates of Rates of Return from Rural Pakistan”, *Journal of Development Economics* 85 (1-2), 94–104 (February).

Berger, Mark C., 1988. “Predicted Future Earnings and Choice of College Major”. *Industrial and Labor Relations Review* 41 (3), 418-29, (April).

Bia Haber Merkezi (Bia News Center), 2001. “Sanayinin Yuzde 85’i Aile Sirketi (85% of Industry is Family Business”, 28 Haziran 2001, http://www.bianet.org/bianet/kategori/bianet/3101/sanayinin-yuzde-85i-aile-sirketi.

Boskin, Michael, 1974. “A Conditional Logit Model of Occupational Choice”, *The Journal of Political Economy* 82 (2), 389-398 (March-April).

Carmichael, Fiona, 2000. “Intergenerational mobility and occupational status in Britain”, *Applied Economics Letters* 7 (6), 391-396 (June).

Dohmen, Thomas, Falk, Armin, Huffman, David, Sunde, Uwe, 2006. “The Intergenerational Transmission of Risk and Trust Attitudes”, IZA Discussion Paper No. 2380 (October).

Dunn, Thomas, Holtz-Eakin, Douglas, 2000. “Financial Capital, Human Capital, and the Transition to Self-Employment: Evidence from Intergenerational Links”, *Journal of Labor Economics* 18 (2), 282-305 (April).

Evans, David S., Leighton, Linda, 1989. "Some Empirical Aspects of Entrepreneurship", *American Economic Review* 79 (3), 19-35 (June).

Guler, Birgul A., 2003. “Turkiye’de Kamu Personel Rejimi Esaslari (The Fundamentals of Turkish Public Personnel Regime)”, Proceedings of the Symposium on the Restructuring of the Turkish Personnel Regime, 22-23 Subat (February), Ankara, Turkey.

Institute for Family Business, 2008. *The UK Family Business Sector*, Report by Capital Economics, February. http://www.ifb.org.uk/

Judd, Kenneth L., 2000. "Is Education as Good as Gold? A Portfolio Analysis of Human Capital Investment". Working Paper. http://bucky.stanford.edu/papers/edumay.pdf

Kerckhoff, Alan C., Campbell, Richard T., Winfield-Laird, Idee, 1985. "Social Mobility in Great Britain and the United States", *American Journal of Sociology* 91 (2), 281-308 (September).

Levhari, David, Weiss, Yoram, 1974. "The Effect of Risk on the Investment in Human Capital", *The American Economic Review* 64 (6), 950-63 (December).

Long, Jason, Ferrie, Joseph, 2005. "A Tale of Two Labor Markets: Intergenerational Occupational Mobility in Britain and the U.S. since 1850", National Bureau of Economic Research Working Paper 11253, Cambridge, MA.

Nguyen, Anh, Haile, Getinet A., 2003. "Intergenerational mobility in educational and occupational status: Evidence from the U.S.", Lancaster University Management School Working Paper, 2003/043.

OSYM, 2002. "2002 Ogrenci Secme ve Yerlestirme Sistemi (OSYS) Yuksekogretim Programlari ve Kontenjanlari Kilavuzu (2002 Student Selection and Placement System Higher Education Programs and Quotas)", Ogrenci Secme ve Yerlestirme Merkezi (Student Selection and Placement Center), Ankara.

OSYM , 2008. "2007-2008 Ogretim Yili Yuksekogretim Istatistikleri (2007-2008 Academic Year Higher Education Statistics)", Ogrenci Secme ve Yerlestirme Merkezi (Student Selection and Placement Center), Ankara.
http://www.osym.gov.tr/BelgeGoster.aspx?F6E10F8892433CFFF88F742D0D71125168BB5005A7961B47

Ovet, Onur, 2006. "Egitim Fakultesi Ogrencilerinin Ogretmenlik Meslegini Tercih Etmelerinde Etkili Olan Faktorlerin Belirlenmesi (Determination of the Factors that Influenced the Occupational Choice of Students of Education Faculty)", Master's Thesis, Yeditepe Universitesi, Sosyal Bilimler Enstitusu.

Saglik Bakanligi (The Ministry of Health), 2005. "Saglik Istatistikleri (Health Statistics) 2004", Saglik Bakanligi Yayin No. (Publication no.) 677, Aralık (December).

Saglik Bakanligi (The Ministry of Health), 2008. Turkiye Saglik Insangucu Durum Raporu (Report on the Current State of Health Manpower in Turkey), Saglik Bakanligi Yayin No. (Publication no.) 739, Mart (March).

Saks, Raven E., Shore, Stephen H., 2005. "Risk and Career Choice", *Advances in Economic Analysis and Policy* 5 (1), Article 7.

Vehid, Suphi, Koksal, Selcuk, Erginoz, Ethem, Yetisyigit, Tarkan, 2001. "Tip Egitimini Secmede Ailede Hekim Bulunmasinin Rolu (The Role of Having a Physician in Family on Selecting Medical Education)", Cerrahpasa Tip Dergisi, 32 (2), 91-96.

Williams, Joseph T., 1979. “Uncertainty and the Accumulation of Human Capital Over the Life Cycle”, *The Journal of Business* 52 (4), 521-48 (October).

Table 4a: Descriptive statistics of the OSS data (Turkish-Math field)

Major Choice	Income	Father self-employed	Father's education	Male	Number of Siblings	Tutoring Hours	Times exam taken	University Exam Score	Population
Education	341.58	0.30	4.15	0.42	3.23	235.84	1.97	130.95	540160.60
n=3284	4.49	0.01	0.03	0.01	0.02	4.95	0.02	0.13	10881.21
	125	0	1	0	1	0	1	100.612	2500
	2500	1	9	1	5	1500	5	159.456	1500000
Business	708.26	0.43	5.06	0.67	2.52	376.48	1.86	133.81	1001813.00
n=608	25.35	0.02	0.07	0.02	0.04	14.62	0.04	0.43	25942.86
	125	0	1	0	1	0	1	107.274	2500
	2500	1	9	1	5	1500	5	165.106	1500000
Econ-Pol-IR	611.03	0.31	4.93	0.63	2.67	377.88	1.86	134.96	984985.60
n=868	17.75	0.02	0.06	0.02	0.04	11.64	0.03	0.35	21781.83
	125	0	1	0	1	0	1	102.701	2500
	2500	1	9	1	5	1500	5	168.443	1500000
Law	610.24	0.32	5.21	0.51	2.75	402.31	1.49	139.39	741126.40
n=779	18.53	0.02	0.06	0.02	0.04	12.22	0.03	0.33	23729.16
	125	0	1	0	1	0	1	105.029	2500
	2500	1	9	1	5	1500	5	164.646	1500000
Social Sciences	619.62	0.33	4.81	0.39	2.73	312.33	2.13	128.78	943236.80
n=604	24.11	0.02	0.07	0.02	0.05	13.64	0.04	0.43	26626.03
	125	0	1	0	1	0	1	102.378	2500
	2500	1	9	1	5	1500	5	167.396	1500000
Literature	404.78	0.30	4.22	0.37	3.09	268.77	2.15	126.04	747788.80
n=277	21.85	0.03	0.10	0.03	0.07	19.82	0.06	0.43	40260.36
	125	0	1	0	1	0	1	105.614	2500
	2500	1	9	1	5	1500	5	154.405	1500000
Total n=6420	474.22	0.32	4.54	0.48	2.98	297.18	1.91	132.37	715287.80
	5.58	0.01	0.02	0.01	0.01	4.01	0.01	0.12	8318.04
	125	0	1	0	1	0	1	100.612	2500
	2500	1	9	1	5	1500	5	168.443	1500000

Note: The statistics listed are the mean, standard deviation, minimum and the maximum, from top to bottom, respectively, for each cell.

Table 4b: Descriptive statistics of the OSS data (Science field)

Major Choice	Income	Father self-employed	Father's education	Male	Number of Siblings	Tutoring Hours	Times exam taken	University Exam Score	Population
Education	335.80	0.26	4.31	0.49	2.22	326.56	1.64	144.46	501542.70
n=1977	5.06	0.01	0.04	0.01	0.03	6.90	0.02	0.27	13280.88
	125	0	1	0	0	0	1	103.292	2500
	2500	1	9	1	4	1500	5	180.63	1500000
Business	765.26	0.37	5.56	0.62	1.60	479.54	1.40	147.44	977178.20
n=303	35.40	0.03	0.09	0.03	0.06	18.27	0.04	0.95	36529.92
	125	0	2	0	0	0	1	108.92	2500
	2500	1	9	1	4	1500	3	178.747	1500000
Econ-Pol-IR	694.35	0.25	5.47	0.60	1.49	420.89	1.57	147.10	1046353.00
n=146	41.68	0.04	0.13	0.04	0.08	28.99	0.06	1.51	49811.85
	125	0	2	0	0	0	1	108.126	2500
	2500	1	9	1	4	1500	3	181.182	1500000
Engineering	600.29	0.29	5.35	0.80	1.60	447.90	1.46	155.26	876435.70
n=2807	9.66	0.01	0.03	0.01	0.02	6.37	0.01	0.31	12274.57
	125	0	1	0	0	0	1	108.065	2500
	2500	1	9	1	4	1500	3	184.264	1500000
Science	476.03	0.29	4.63	0.54	1.81	384.85	1.82	138.28	893236.30
n=1168	11.44	0.01	0.05	0.01	0.03	10.16	0.02	0.41	19184.52
	125	0	1	0	0	0	1	105.326	2500
	2500	1	9	1	4	1500	3	180.824	1500000
Health	447.70	0.25	5.02	0.48	1.91	404.46	1.48	154.71	639503.80
n=2524	6.66	0.01	0.03	0.01	0.02	6.43	0.01	0.32	12518.49
	125	0	1	0	0	0	1	103.893	2500
	2500	1	9	1	4	1500	3	182.398	1500000
Total	489.43	0.28	4.94	0.60	1.85	401.11	1.55	150.09	734786.00
n=8925	4.43	0.00	0.02	0.01	0.01	3.50	0.01	0.17	6905.56
	125	0	1	0	0	0	1	103.292	2500
	2500	1	9	1	4	1500	5	184.264	1500000

Note: The statistics listed are the mean, standard deviation, minimum and the maximum, from top to bottom, respectively, for each cell.

Table 5a: Determinants of choosing a college major in the Turkish-Math data.
Multinomial Logit Model: Base Category: Education

	Without university dummies					With university dummies				
	Business	Econ-Pol-IR	Law	Social Sciences	Literature	Business	Econ-Pol-IR	Law	Social Sciences	Literature
income (ln)	1.969***	1.841***	1.701***	1.799***	1.097	1.489***	1.532***	1.249**	1.358***	1.072
	(0.14)	(0.12)	(0.12)	(0.13)	(0.11)	(0.12)	(0.12)	(0.10)	(0.12)	(0.11)
Father self-employed	1.977***	1.161	1.323**	1.265*	1.001	1.619***	1.053	1.09	1.028	0.9
	(0.20)	(0.11)	(0.13)	(0.13)	(0.14)	(0.18)	(0.11)	(0.12)	(0.13)	(0.13)
Father's education	1.122***	1.072*	1.208***	1.071*	0.967	1.105**	1.066	1.133***	1.03	1.033
	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Male	3.903***	3.195***	1.942***	1.146	0.937	2.861***	2.608***	1.270*	1.287*	1.114
	(0.39)	(0.27)	(0.18)	(0.11)	(0.12)	(0.31)	(0.26)	(0.13)	(0.15)	(0.15)
No.of siblings	0.718***	0.825***	0.987	0.811***	0.944	0.813***	0.892*	1.000	0.875*	0.993
	(0.04)	(0.03)	(0.04)	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)
Tutoring hours	1.000*	1.000***	1.001***	1.000	1.001*	1.000	1.000*	1.000	1.000	1.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Times exam taken	1.059	1.049	0.713***	1.256***	1.142*	1.106	1.029	0.805***	1.305***	1.166*
	(0.06)	(0.05)	(0.04)	(0.06)	(0.07)	(0.07)	(0.05)	(0.05)	(0.08)	(0.08)
ÖSS score	1.027***	1.040***	1.088***	0.968***	0.928***	1.030***	1.038***	1.090***	0.941***	0.930***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Population (ln)	1.323***	1.341***	1.041	1.285***	1.152***	1.209***	1.244***	0.995	1.164***	1.121**
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
University dummies	no	no	no	no	no	yes	yes	yes	yes	yes
Pseudo R2	0.13					0.18				
Number of Observations	6420					6412				

Source: Authors' calculations based on the 2002 OSS data.
Note: We exclude the students who have indicated open university or evening programs as their first choice. Values reported show the change in the odds ratios (=exp(β)) in response to an increase in the regressors. *, ** and *** indicate statistical significance at 1%, 5% and 10%, respectively.

Table 5b: Determinants of choosing a college major in the Science data.
Multinomial Logit Model: Base Category: Health

	Without university dummies					With university dummies				
	Education	Business	Econ-Pol-IR	Engineering	Science	Education	Business	Econ-Pol-IR	Engineering	Science
income (ln)	0.840**	2.152***	2.294***	1.407***	1.221**	0.852*	1.588***	1.824***	1.292***	1.112
	(0.04)	(0.22)	(0.33)	(0.07)	(0.08)	(0.05)	(0.18)	(0.29)	(0.08)	(0.08)
Father self-employed	0.784**	1.737***	0.974	1.398***	1.073	0.780**	1.416*	0.785	1.308**	0.988
	(0.06)	(0.24)	(0.20)	(0.10)	(0.09)	(0.07)	(0.21)	(0.17)	(0.11)	(0.10)
Father's education	0.876***	1.056	0.971	1.022	0.878***	0.858***	1.044	0.99	1.024	0.889***
	(0.02)	(0.05)	(0.06)	(0.02)	(0.02)	(0.02)	(0.05)	(0.07)	(0.03)	(0.03)
Male	1.088	2.609***	2.213***	5.273***	1.783***	1.213*	3.413***	2.999***	6.293***	2.301***
	(0.07)	(0.34)	(0.39)	(0.35)	(0.14)	(0.09)	(0.48)	(0.57)	(0.52)	(0.21)
No.of siblings	1.079*	0.911	0.756**	0.792***	0.830***	1.006	1.008	0.893	0.885**	0.93
	(0.03)	(0.06)	(0.07)	(0.02)	(0.03)	(0.04)	(0.07)	(0.09)	(0.03)	(0.04)
Tutoring hours	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Times exam taken	0.964	0.737**	1.139	0.989	1.387***	0.96	0.98	1.394*	1.112	1.634***
	(0.05)	(0.08)	(0.16)	(0.05)	(0.08)	(0.06)	(0.11)	(0.21)	(0.07)	(0.11)
ÖSS score	0.961***	0.959***	0.963***	0.992***	0.932***	0.941***	0.923***	0.925***	0.954***	0.900***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
Population (ln)	0.929***	1.282***	1.456***	1.227***	1.261***	0.931***	1.200***	1.359***	1.201***	1.245***
	(0.02)	(0.06)	(0.10)	(0.02)	(0.03)	(0.02)	(0.05)	(0.09)	(0.03)	(0.03)
University dummies	no	no	no	no	no	yes	yes	yes	yes	yes
Pseudo R2	0.13					0.33				
Number of Observations	8925					8884				

Source: Authors' calculations based on the 2002 OSS data.
Note: We exclude the students who have indicated open university or evening programs as their first choice. Values reported show the change in the odds ratios (=exp(β)) in response to an increase in the regressors. *, ** and *** indicate statistical significance at 1%, 5% and 10%, respectively.

Table 6: Major choice persistence
The dependent variable is the index that shows the persistence of major choice in the top three choices. Index =1, if the student lists the same major in all of her top three choices; 0.5, if she lists the same major in both of her top two choices; and 0, otherwise.

Turkish-math field		**Science field**	
Education	omitted dummy	Education	0.121***
			(0.01)
Business	-0.541***	Business	-0.430***
	(0.02)		(0.03)
Econ-Pol-IR	-0.339***	Econ-Pol-IR	-0.460***
	(0.02)		(0.03)
Law	-0.227***	Engineering	-0.029*
	(0.02)		(0.01)
Social science	-0.535***	Science	-0.054**
	(0.02)		(0.02)
Literature	-0.207***	Health	omitted dummy
	(0.03)		
Income (ln)	-0.010	Income (ln)	0.012
	(0.01)		(0.01)
Father self-employed	-0.006	Father self-employed	0.008*
	(0.01)		(0.00)
Father's education	-0.003	Father's education	0.0199*
	(0.00)		(0.00)
Male	0.024*	Male	0.009
	(0.01)		(0.00)
No. of siblings	0.009	No. of siblings	0.000
	(0.00)		(0.00)
Tutoring hours	0.000	Tutoring hours	-0.009
	(0.00)		(0.01)
Times exam taken	-0.028***	Times exam taken	0.00205***
	(0.01)		(0.00)
OSS score	0.003***	OSS score	-0.014***
	(0.00)		(0.00)
Population (ln)	-0.012***	Population (ln)	0.587***
	(0.00)		(0.07)
Constant	0.744***	Constant	1.799***
	(0.10)		(0.13)
Adj. R2	0.27		0.10
No. of observations	5418		7965

Source: Authors' calculations based on the 2002 OSS data.
Note: The regression is estimated by OLS. Robust standard errors are in parentheses.

Appendix Table A1:
OLS regression estimates of monthly compensation on individual and parental characteristics of Bilkent University graduates.

	Coefficient (Std.Error)	
Sex	677.7792	***
	(137.53)	
Job experience	200.3315	***
	(38.38)	
Experience	251.2484	***
	(40.78)	
Age	-417.133	**
	(182.76)	
Age squared	9.041082	**
	(2.93)	
Dummy: Father primary school graduate	1018.533	
	(736.11)	
Dummy: Father junior high school graduate	745.8175	
	(790.55)	
Dummy: Father high school graduate	1082.336	
	(729.17)	
Dummy: Father vocational school graduate	834.5121	
	(779.77)	
Dummy: Father university graduate	1314.737	*
	(713.07)	
Dummy: Father Master's degree	1523.697	**
	(737.46)	
Dummy: Father Ph.D. Degree	914.1692	
	(738.30)	
Constant	5294.225	*
	(2890.58)	
Adj. R-squared	0.3859	
N	682	

Note: Data are from the survey that we conducted on Bilkent University graduates.
*, ** and *** indicate statistical significance at 1%, 5% and 10%, respectively.